TRAVAUX DU MUSÉUM NATIONAL D'HISTOIRE NATURELLE «GRIGORE ANTIPA»

THE JOURNAL OF "GRIGORE ANTIPA" NATIONAL MUSEUM OF NATURAL HISTORY

Travaux du Muséum National d'Histoire Naturelle "Grigore Antipa" 67 (2): 279–285 (2024)
doi: 10.3897/travaux.67.e117675

FAUNISTIC NOTE

First record of *Atypophthalmus umbratus* (Diptera, Limoniidae) from Central Europe, a species introduced accidentally throughout global trade of exotic plants

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Received 21 December 2023 | Accepted 15 March 2024 | Published 31 December 2024

Citation: Jancsó B-Z, Kárpáti M, Keresztes L (2024) First record of *Atypophthalmus umbratus* (Diptera, Limoniidae) from Central Europe, a species introduced accidentally throughout global trade of exotic plants. Travaux du Muséum National d'Histoire Naturelle "Grigore Antipa" 67(2): 279–285. https://doi.org/10.3897/travaux.67.e117675

Abstract

Here we report the first data of the exotic *Atypophthalmus umbratus* (de Meijere, 1911) from two Central European countries, Romania and Hungary. This is the first time that the presence of an introduced exotic species of Limoniidae (Diptera) has been reported in the area. The above-mentioned species was first observed in Cluj, Romania, on tropical plant specimens (e.g. *Alocasia x mortfontanensis* 'Polly'), which we bought from a large store selling tropical plants, from which both male and female specimens were collected. After that, checking some citizen science platforms of entomological interest, we also noticed record of the species in Hungary, based on their conspicuous wing pattern and general habitus. The presence of this accidentally introduced species far from its native tropical environment highlights the growing intensity of the global exotic plant market and the importance of citizen science in early warning systems for biological invasions.

Keywords

crane flies, first record, introduced species, global trade, exotic plant market, social media

Biogeographical regions naturally formed because of millions of years of evolutionary processes have a high degree of resistance to the colonization of alien species (Daru et al. 2018). At the borders of biogeographical regions, there are natural barriers that exclude or greatly limit the penetration of alien species, thus ensuring the stability and adaptability of ecological systems in a globally changing world (Wittenberg and Cock 2001). In the current Anthropocene, the resilience of biogeographical regions seems to be weakening, because the globalizing and increasingly intensive trade may release dozens of exotic species from their original habitat to remote areas (Nijman et al. 2022). Species introduced in this way – intentionally or accidentally – can escape into the wild, causing irreversible damage to native ecosystems and ultimately leading to the extinction of native species (Largiadèr 2007).

Atypophthalmus umbratus (de Meijere, 1911) is a member of the large and widespread Limoniidae family of Diptera. The species was first described by de Meijere from Indonesia in 1911 as *Dicranomyia umbrata* de Meijere, 1911 from a coastline suburbia of Jakarta (the formerly Batavia), Tanjung Priok, based on some specimens collected between October and November (de Meijere 1911; Savchenko et al. 1992). The species were also noticed from the Oriental regions as *Atypophthalmus holopticus* Brunetti, 1911 and *Dicranomyia subumbratus* (Alexander, 1923) (Alexander 1923; Brunetti 1911) and later as *Limonia fissilis* (Alexander, 1926) from the Neotropical regions, too. All the three aforementioned species were later synonymized with *A. umbratus* (de Meijere 1911) by Alexander (1939, 1956, 1971) and (E Brunetti and Edwards 1924).

According to Oosterbroek (2024) the species has, in present, a pan-tropical distribution with several records from Brazil, Cuba, Hawaiian Islands, India, Indonesia, Kenya, Madagascar, Malaysia, Mauritius, Mexico, Nigeria, Peru, Philippines, South Africa, Taiwan, Thailand. However, in later years the species was also recorded far from the original tropical regions, in temperate area, in countries, like Belgium (Kolcsár et al. 2021), Canary Islands (Mederos López 2009), Great Britain (Stubbs 2021), the Netherlands (Oosterbroek 2009), Spain (Mederos et al. 2019, 2023) Sweden (Ennerfelt 2020), Egypt; Israel (Starý and Freidberg 2007) Japan (Kato 2022, 2020). It is important to mention that in temperate regions of Europe the species was collected in botanical gardens in the wet tropical zones. It is considered introduced and established in these environments, most likely because of the constant high humidity and temperature throughout the year. The species were never mentioned in similar conditions in Central Europe so far.

On October 1, 2023, we collected two males in Cluj, Romania, from a tropical plant, *Alocasia x mortfontanensis* 'Polly', which we bought from a wholesale warehouse (Brico Store) in the city (leg. Marcell Kárpáti). The specimens were identified as *Atypophthalmus umbratus* using all information available at the Catalogue of the Craneflies of the World (Oosterbroek 2024) available at https://ccw.naturalis.nl/. The plant has the plant passport number: BNL-723221634.

Once noticed the species, we followed regularly the plant environment in our flat (46.756527°N, 23.545357°E), and identified, later until November, further specimens

(males and females), all together a number of three males and four females. The specimens were deposited in the Diptera Collection of the Faculty of Biology and Geology (acronym DCFBG), University Babeș-Bolyai, Cluj-Napoca, Romania.

Prior to identification and morphological examination, both male and female terminalia were left overnight in 10% KOH and thereafter one hour in undiluted glacial acetic acid to neutralize and wash out the soap that was created from the soft tissues. Then, the genitalia were transferred to a larger amount of glycerol in order to wash out the acid, and then to a drop of glycerol on a slide with rounded excavation. The slide was carefully transferred to the compound microscope in order to take the photos. Finally, the genital parts were placed in micro vials containing 50–50% ethanol and glycerol and were pinned under the dry specimens. Photos of adult male and wing were taken with a stereomicroscope (Olympus SZ51) with a Canon EOS 650D digital camera attached. Photos were taken using a Canon EOS 750D digital camera, attached to the microscope (Olympus CX23), with an LM Digital SLR Adapter (MicroTechLab, Austria). Layer photos were combined using Zerene Stacker software. Stacking results consist of 10–15 single exposures with the stereomicroscope and 20–50 exposures with the compound microscope. Male and female body parts and terminalia are presented in Figure 1.

In addition to the specimens actually collected, we also reviewed the social media dealing with insects in the region and found that the species is also present in Hungary. However, apart from the data found on the social media page (https://www.izeltlabuak.hu/), this record was not officially published. The information uploaded on the social media site was recorded by Szabolcs Fráter in October 9, 2020, with the collection data on 13 November 2010 and geographic coordinates 47.484426298004°N, 19.084750912863°E, referring to the Viktória House with tropical plants of the Fűvészkert Botanical Graden, Budapest, Hungary (information under license: Fráter Szabolcs, izeltlabuak.hu, license: CC BY 4.0).

Our data are the first reliable records of the presence of *A. umbratus* in Central Europe. The data from Hungary, which we provide here for the first time, also comes from a greenhouse, which proves that the species can appear all over the world far from tropics, in man-made artificial environment with high-humidity and high temperarture all over the year. The species has very few chances to escape into the wild in the temperate climate zone, because of its specific tropical ecological demands.

Compared to most data from temperate sites, the Romanian data is unique in that the specimens come from a large wholesale warehouse in Cluj (Brico Store), where a large number of tropical plants are kept together and sold to different people, so the species can appear not only in closed botanical garden systems, but also in private homes, giving a chance under the conditions of current global climate warming for the species to become established in our natural environment, away from the tropics.

The specimens from Cluj, Romania were collected on *Alocasia* sp., a tropical plant originally from Indonesia, which also represents the region where de Meijere described the crane fly species in 1911. However, our data shows that our specimen originates from Europe, and the passport number on the plant's container confirms

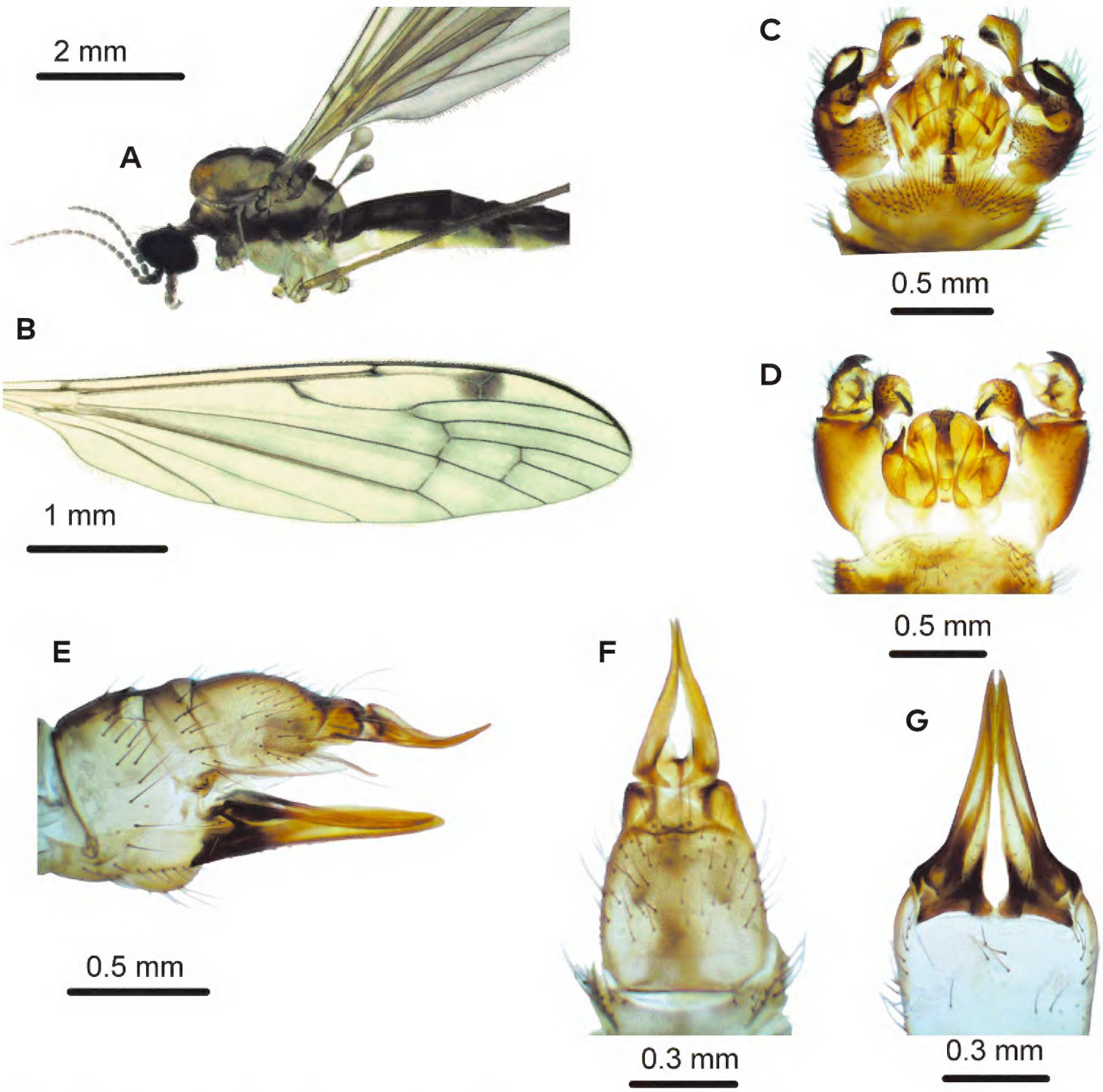

Figure 1. *Atypophthalmus umbratus* (de Meijere 1911): **A** male body with the conspicuous brown stripe on the body, lateral view (with genitalia cut off); **B** male right wing; **C** male genitalia dorsal; **D** male genitalia ventral; **E** female terminalia lateral; **F** female genitalia (ovipositor) dorsal; **G** female genitalia (cerci) dorsal.

this (Figure 2). Therefore, in connection with the presence of the species in Romania, the suspicion may arise that the Brico Store wholesale network procures their tropical plants from the Netherlands, where the plants are grown in greenhouse conditions and supply the European market from there. However, the soil of the plants may be infected, so the larvae that develop in the soil between the roots of the plants spread throughout Europe through the Netherlands and may appear in various European countries.

A. umbratus is an introduced species with a high tropical ecological demand and no evidences of its establishment and distribution in our native environment.

Figure 2. *Alocasia x mortfontanensis* 'Polly', the exotic plant with its plant-passport, where the introduced *A. umbratus* were spotted.

However, the ongoing global warming may give the species a chance to escape into natural environment in temperate regions, too, which would burden our native ecosystems with another alien species. In addition, the increasing number of introduced species in Central Europe may also reduce the resilience of native ecosystems from here in the era of the ongoing insect apocalypse (Chaffin et al. 2016).

Citizen science and different social media platforms can effectively support monitoring and early warning systems to detect and manage the presence of some introduced or invasive species (Larson et al. 2020), as our study has shown, helping specialists and decision-makers to take quick and effective measures to reduce pressures on our native biodiversity. Due to the increasing interest of society in observing the surrounding wildlife, we therefore recommend the common names of the species mentioned here, as follows: musca de mâl dungată de seră (Romanian), oldalcsíkos üvegházi iszapszúnyog (Hungarian) and side-striped greenhouse crane fly (English). This can also make it easier for amateurs to identify additional individuals and monitor distribution of the species.

Acknowledgements.

We are indebted to Fráter Szabolcs, with whose kind permission we were able to use the Hungarian data on the species in this article.

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